

CLAIMS

I claim:

5        1        A system comprising:  
                a fluid dispensing pump including a feed screw driven by a motor having  
                indexed rotational positions;  
                a position controller for controlling the position of the pump relative to a  
                substrate, the position controller generating a time-duration-based pump control signal;  
10        and  
                a dispensing controller for controlling a dispensing operation of the pump, the  
                dispensing controller initiating the dispensing operation in response to the pump  
                control signal by generating an index signal for the motor for initiating rotation in the  
                motor based on the indexed rotational positions.

15        2        The system of claim 1 wherein the feed screw includes a helical cavity defined  
                between a major diameter and a minor diameter of a thread of the feed screw, and  
                wherein the fluid dispensing pump further includes a cartridge having a cavity in  
                communication with the feed screw for introduction of dispensing fluids into the  
                helical cavity.

20        3        The system of claim 2 wherein the cartridge comprises:  
                a body having a bore;  
                a fluid inlet at a proximal end of the bore;  
                a fluid outlet at a distal end of the bore; and

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a feed screw for delivering fluid from the fluid inlet to the fluid outlet, the feed screw having a longitudinal axis, the fluid inlet being elongated in a direction along the longitudinal axis of the feed screw.

5        4      The system of claim 1 wherein the motor comprises a closed-loop servo-motor.

5        5      The system of claim 4 further comprising a transmission coupled between the servo-motor and feed screw for gearing the feed screw relative to the servo-motor.

10       6      The system of claim 4 wherein the motor further includes a positional encoder.

15       7      The system of claim 1 wherein the position controller controls the position of the pump relative to the substrate along three normal Cartesian coordinate axes (x, y, z).

20       8      The system of claim 1 wherein initiation of the time-duration-based control signal indicates that the pump is in position for a dispensing operation.

25       9      The system of claim 1 wherein the time-duration-based control signal comprises a rectangular waveform having a rising edge and a falling edge.

10       10     The system of claim 9 wherein the rising edge precedes the falling edge.

11       11     The system of claim 9 wherein the falling edge precedes the rising edge.

12       12     The system of claim 1 wherein the dispensing controller, upon completion of the dispensing operation, generates a completion signal for indicating to the position controller that the dispensing operation is completed.

13 The system of claim 1 wherein the index signal comprises a count signal indicating the number of indexed rotational positions to be traversed by the motor.

14 The system of claim 1 wherein the index signal comprises a velocity signal indicating the rotational velocity of the motor.

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15 The system of claim 1 wherein the index signal comprises an acceleration signal indicating the rotational acceleration of the motor.

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16 The system of claim 1 wherein the position controller fixes the position of the pump during the dispensing operation.

17 The system of claim 16 wherein the dispensing operation dispenses a dot.

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18 The system of claim 1 wherein the position controller places the pump in motion during the dispensing operation.

19 The system of claim 18 wherein the dispensing operation dispenses a line.

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20 The system of claim 19 wherein the index signal causes the motor to rotate at a fixed angular rate during the dispensing of a line.

21 The system of claim 1 wherein the dispensing controller comprises:

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an interface unit for receiving the pump control signal and for converting the pump control signal to an intermediate signal; and

a pump motion control unit for generating the index signal in response to the intermediate signal.

22 The system of claim 1 wherein the dispensing controller further comprises:  
an user interface for programming the dispensing controller with a dispensing operation program; and  
a processor for processing the dispensing operation program.

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23 The system of claim 22 wherein the user interface comprises a touch screen interface.

24 The system of claim 22 wherein the user interface comprises a computer interface.

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25 A method for controlling a fluid dispensing operation comprising:  
controlling the position of a fluid dispensing pump relative to a substrate at a position controller, the fluid dispensing pump including a feed screw driven by a motor having indexed rotational positions, the position controller generating a time-duration-based pump control signal; and  
controlling a dispensing operation of the pump at a dispensing controller that initiates the dispensing operation in response to the pump control signal by generating an index signal for the motor for initiating rotation in the motor based on the indexed rotational positions.

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26 The method of claim 25 wherein the motor comprises a closed-loop servo-motor.

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27 The method of claim 25 further comprising providing a transmission coupled between the servo-motor and feed screw for gearing the feed screw relative to the servo-motor.

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28 The method of claim 26 wherein the motor further includes a positional encoder.

29 The method of claim 25 further comprising controlling the position of the pump relative to the substrate along three normal Cartesian coordinate axes (x, y, z).

30 The method of claim 25 wherein initiation of the time-duration-based control signal indicates that the pump is in position for a dispensing operation.

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31 The method of claim 25 wherein the time-duration-based control signal comprises a rectangular waveform having a rising edge and a falling edge.

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32 The method of claim 31 wherein the rising edge precedes the falling edge.

33 The method of claim 31 wherein the falling edge precedes the rising edge.

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34 The method of claim 25 further comprising the dispensing controller, upon completion of the dispensing operation, generating a completion signal for indicating to the position controller that the dispensing operation is completed.

35 The method of claim 25 wherein the index signal comprises a count signal indicating the number of indexed rotational positions to be traversed by the motor.

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36 The method of claim 25 wherein the index signal comprises a velocity signal indicating the rotational velocity of the motor.

37 The method of claim 25 wherein the index signal comprises an acceleration signal indicating the rotational acceleration of the motor.

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38 The method of claim 25 wherein the position controller places the pump in a dormant state during the dispensing operation.

39 The method of claim 38 wherein the dispensing operation dispenses a dot.

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40 The method of claim 25 wherein the position controller places the pump in motion during the dispensing operation.

41 The method of claim 40 wherein the dispensing operation dispenses a line.

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42 The method of claim 41 wherein the index signal causes the motor to rotate at a fixed angular rate during the dispensing of a line.

43 A dispensing controller for a fluid dispensing pump including a feed screw driven by a motor having indexed rotational positions, the dispensing controller for controlling a dispensing operation of a pump, the dispensing controller initiating the dispensing operation in response to a pump control signal by generating an index signal for the motor for initiating rotation in the motor based on the indexed rotational positions, the pump control signal received from a position controller that controls the position of the pump relative to a substrate, the pump control signal comprising a time-duration-based signal.

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44 The dispensing controller of claim 43 wherein initiation of the time-duration-based control signal indicates that the pump is in position for a dispensing operation.

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45 The dispensing controller of claim 43 wherein the time-duration-based control signal comprises a rectangular waveform having a rising edge and a falling edge.

46 The dispensing controller of claim 45 wherein the rising edge precedes the falling edge.

47 The dispensing controller of claim 45 wherein the falling edge precedes the rising edge.

5 The dispensing controller of claim 43 wherein the dispensing controller, upon completion of the dispensing operation, generates a completion signal for indicating to the position controller that the dispensing operation is completed.

10 The dispensing controller of claim 43 wherein the index signal comprises a count signal indicating the number of indexed rotational positions to be traversed by the motor.

15 The dispensing controller of claim 43 wherein the index signal comprises a velocity signal indicating the rotational velocity of the motor.

20 The dispensing controller of claim 43 wherein the index signal comprises an acceleration signal indicating the rotational acceleration of the motor.

25 The dispensing controller of claim 43 wherein the dispensing controller comprises:  
an interface unit for receiving the pump control signal and for converting the pump control signal to an intermediate signal; and  
a pump motion control unit for generating the index signal in response to the intermediate signal.

53 The dispensing controller of claim 43 wherein the dispensing controller further comprises:  
an user interface for programming the dispensing controller with a dispensing operation program; and  
a processor for processing the dispensing operation program.

54 The dispensing controller of claim 53 wherein the user interface comprises a touch screen interface.

55 The dispensing controller of claim 53 wherein the user interface comprises a computer interface.